Letters to the Editor.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, nor to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

The Nature of the Penetrating Radiation.

UP to the present time the view that the penetrating radiation consists of short gamma rays has been prevalent chiefly because the large penetrating power which these rays possess is associated with radiation of gamma ray type. Our recent experiments, however, indicate that this radiation is of corpuscular nature.

The experimental arrangement consisted simply of two 'tube-counters,' of the type recently developed by Geiger and Müller (*Die Naturwiss.*, 16, 617; 1928), which were placed above one another at some distance apart in a space screened by 6 cm. of lead and 5 cm. of iron. Each of the counters was connected to an electrometer, and the deflections of the two electrometers, which were due chiefly to the penetrating radiation (Geiger, *Phys. Zeitschr.*, 29, 839; 1928), were registered side by side on a moving film. With this arrangement a considerable number of simultaneous deflections of both instruments was recorded. For small distances between the counters, up to about 20 per cent of the total number of deflections of one counter were coincident pairs. This percentage is so great that it must be explained on the basis that coincidences occur if the same corpuscular ray enters both counters.

Two hypotheses may be made concerning the origin of this corpuscular radiation. One is that the primary radiation may be of the gamma type and the coincidences the result of secondary electrons. In this case one would expect the corpuscular rays to be more easily absorbed than the penetrating radiation that caused them. The alternative is that the penetrating radiation is really of corpuscular nature, in which case agreement should exist between the absorption coefficient of the rays causing the coincident deflections and that directly measured for the penetrating radiation itself.

In order to distinguish between these alternatives, a block of gold 4.1 cm. thick was placed between the counters, the diminution in the number of coincidences thereby giving a measure of the absorption of the corpuscular rays. The first attempts were made in a laboratory of the Reichsanstalt, where the thick floors and ceilings of the rooms above us greatly hardened the radiation. There was no definite diminution in the number of coincident pairs under these conditions. We then repeated the experiment on the roof of the building with the lid of the screen removed. Under these conditions the unfiltered radiation from above acted directly on the counters, and a definite diminution in the number of coincidences was observed on introducing the gold block. The observed difference gives $(\mu/\rho)_{\text{Au}} = (3.6 \pm 0.5) \times 10^{-3}$ for the mass absorption coefficient. This value agrees well with that measured directly for the unfiltered cosmic rays. We conclude from these data that the penetrating radiation is not of gamma but of corpuscular type.

The complete description and discussion of these experiments will appear in the *Zeitschrift für Physik*.

W. BOTHE.

W. KOLHÖRSTER.

Physikalisch-Technische Reichsanstalt,
Berlin-Charlottenburg,
Meteorologisch-magnetisches Observatorium,
Potsdam, April 3.

Temperature Conditions in the Suez Canal, July–December 1928.

THE study of the temperatures met with in the Suez Canal is invested with more than ordinary interest in view of the linkage affected between two different sea areas and the possibilities of an exchange of faunas.

The Cambridge expedition to the Suez Canal (*Transactions of the Zoological Society*, 1927) has shown that more marine animals have moved from the Red Sea to the Mediterranean than from the Mediterranean to the Red Sea. The expedition also published valuable evidence to show that for most of the year the canal water was under the influence of a slow residual drift from the Red Sea. This, however, was reversed during the months of the Nile flood.

In studying the question of the migration of young or drifting organisms through the canal, temperature has very rightly been considered as of first importance as a possible limiting factor.

The only series of data concerning the temperatures of the canal that offer anything like a contemporaneous series are those taken by the *Pola* expedition in October 1895 and May 1896.

The present observations were all made within two days on each occasion and so were very nearly simultaneous.

The following list shows the positions at which they were made:

- Suez Canal Station 1. Opposite entrance buoy to Suez Canal, Port Said.
 „ „ 2. Opposite Canal Company's signal station at Ballah.
 „ „ 3. 1 kilometre S.E. of the Canal Company's landing stage at Ismailia.
 „ „ 4. Opposite the Northern Light Buoy of the Great Bitter Lakes.
 „ „ 5. "Kilometre 130" of the Canal.
 „ „ 6. Opposite the last buoy but one of the Suez Canal at Suez.

It is the intention of the directorate of Fisheries Research, Coastguards and Fisheries Service, to take routine temperature and salinity observations from these positions over a run of years.

The surface observations for July 1928 and February–March 1929 are shown here:

Station	S.C.1	2	3	4	5	6
Date . . .	19.7.28	19.7.28	19.7.28	20.7.28	20.7.28	20.7.28
Time . . .	1043	1450	1637	1228	1628	1855
Temperature, °C.	28.92	29.28	29.60	29.18	28.85	26.55
Date . . .	28.2.29	28.2.29	28.2.29	1.3.29	1.3.29	1.3.29
Time . . .	1034	1505	1705	1139	1343	1753
Temperature, °C.	14.32	14.70	14.96	15.25	17.85	17.53

A Nansen-Petersen insulated closing bottle was used with a Schmidt thermometer.

Examining the Cambridge and *Pola* expedition temperatures, one is struck by the anomaly of higher figures for Port Said than for Suez. This same condition is shown in my figures for July. In February–March, however, there is a higher temperature at Suez than at Port Said, and from Station S.C.2 to Suez there is a steady rise along the whole length of the canal.

There seems to be, then, a higher temperature at the northern end of the canal than the southern in summer, and a higher temperature at the southern than the northern end in winter. This relatively higher summer temperature of the water at Port Said is quite inexplicable on ordinary considerations of position, and I am led to suggest the following explanation.